Calendar No. 141

105TH CONGRESS, *1st Session* | SENATE | REPORT 105–59

EARTHQUAKE HAZARDS REDUCTIONS ACT

R E P O R T

OF THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ON

S. 910

JULY 30, 1997.—Ordered to be printed

U.S. GOVERNMENT PRINTING OFFICE

39–010 WASHINGTON : 1997

SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED FIFTH CONGRESS
FIRST SESSION
JOHN McCAIN, Arizona, *Chairman*

TED STEVENS, Alaska
CONRAD BURNS, Montana
SLADE GORTON, Washington
TRENT LOTT, Mississippi
KAY BAILEY HUTCHISON, Texas
OLYMPIA SNOWE, Maine
JOHN ASHCROFT, Missouri
BILL FRIST, Tennessee
SPENCER ABRAHAM, Michigan
SAM BROWNBACK, Kansas

ERNEST F. HOLLINGS, South Carolina
DANIEL K. INOUYE, Hawaii
WENDELL H. FORD, Kentucky
JOHN D. ROCKEFELLER IV, West Virginia
JOHN F. KERRY, Massachusetts
JOHN B. BREAUX, Louisiana
RICHARD H. BRYAN, Nevada
BYRON L. DORGAN, North Dakota
RON WYDEN, Oregon

JOHN RAIDT, *Staff Director*
IVAN A. SCHLAGER, *Democratic Chief Counsel and Staff Director*

Calendar No. 141

105TH CONGRESS *1st Session* | SENATE | REPORT 105–59

EARTHQUAKE HAZARDS REDUCTIONS ACT

JULY 30, 1997.—Ordered to be printed

Mr. MCCAIN, from the Committee on Commerce, Science, and Transportation, submitted the following

REPORT

[To accompany S. 910]

The Committee on Commerce, Science, and Transportation, to which was referred the bill (S. 910) "A Bill to authorize appropriations for carrying out the Earthquake Hazards Reduction Act of 1977 for fiscal years 1998 and 1999, and for other purposes.", having considered the same, reports favorably thereon with an amendment (in the nature of a substitute) and recommends that the bill (as amended) do pass.

PURPOSE OF THE BILL

The bill as reported authorizes the funding for and projects of the National Earthquake Hazards Reduction Program (NEHRP) for fiscal years (FY) 1998 and 1999. The funding level for the U.S. Geological Survey (USGS) includes the redirection of $3.8 million in funding from the Department of Defense for FY98 for the Global Sensor Network (GSN). The bill also directs the National Science Foundation (NSF) to facilitate the creation of K–12 Earth Science teaching materials which are to be made readily accessible to school boards and educators. The bill authorizes USGS to begin the construction of an earthquake hazard warning system that uses the information from the national seismic sensor network and produces alerts to high risk activities (such as trains), and to the general public. Finally, the bill, as amended, directs USGS to perform a seismic hazard assessment on areas of the country that have been historically understudied.

BACKGROUND AND NEEDS

CONTINUING NEED FOR NEHRP

Catastrophic earthquakes are inevitable in the United States. Scientists consider California to be the most likely location for major earthquakes, but all or parts of 38 States and 3 territories have been classified as having major or moderate seismic risk. Major earthquakes east of the Rocky Mountains are infrequent but can prove devastating. In 1811–12, three huge earthquakes rocked the New Madrid area of Missouri, near St. Louis and Memphis, changing the course of the Mississippi River. In 1886, an earthquake leveled Charleston, SC.

The loss of life and property from earthquakes can be considerable. The January 17, 1994, earthquake at Northridge, CA was classified as "moderate" in magnitude, registering 6.8 on the Richter scale. Nonetheless, 57 people died and injuries totaled over 6,500. In addition, insurance payments for this earthquake exceeded $6 billion, and the Federal supplemental appropriation totaled another $9 billion. Even though the Northridge earthquake was classified as a "moderate" quake, it has become the second most expensive natural disaster in American history, exceeded only by Hurricane Andrew which cost over $10 billion. Reducing damage from earthquakes would not only save lives but also save costs for both private insurers and the Federal Government.

HISTORY OF THE NATIONAL EARTHQUAKE HAZARDS REDUCTION PROGRAM

The Earthquake Hazards Reduction Act of 1977 established NEHRP to coordinate the earthquake research conducted by the various Federal agencies and to improve earthquake preparedness. Early efforts of NEHRP focused on earthquake prediction. Over the past decade, however, the program has shifted focus toward development and application of earthquake technologies to mitigate earthquake risks, especially technologies which make buildings and infrastructure more resistant to strong ground motion. NEHRP also helps States and local communities prepare for earthquakes, while separate Federal disaster response programs help States after a major seismic event occurs.

The four principal agencies involved in NEHRP are: (1) the Federal Emergency Management Agency (FEMA), (2) USGS, (3) NSF, and (4) the National Institute of Standards and Technology (NIST). FEMA serves as the lead agency for NEHRP, responsible for coordinating the roles of the participating agencies and developing the overall strategy for the program. FEMA is also responsible for assisting States with earthquake preparedness through providing technical documents, public education, information on building codes, and grants for emergency preparedness.

USGS is responsible for investigating earthquake dynamics and risks in particular regions of the country. Specifically, USGS operates the national system of seismographs, conducts research on earthquake forecasting and prediction, provides detailed regional seismic risk maps, and works with engineers on the effects of strong ground motion on buildings.

NSF supports academic research on plate tectonics and earthquake processes, civil engineering, and the social and economic aspects of earthquake hazard mitigation.

NIST's Building and Fire Research Laboratory conducts research on building materials and structures and works with model building code organizations to transfer this research to the construction industry and States.

NEHRP appropriations are customarily reauthorized in one bill which covers the four principal agencies. Funding for each agency's part of the program is appropriated individually as part of that agency's appropriations. The authorizations under NEHRP for NSF and NIST duplicate authorizations provided for those agencies in other legislation, while USGS and FEMA derive authority to conduct earthquake activities solely from the Earthquake Hazards Reduction Act of 1977. Appropriations under the Act have been reauthorized several times after it was enacted in 1977. The most recent reauthorization expired on September 30, 1996.

In addition to the four principal agencies, several other agencies participate in NEHRP activities, including the Department of Defense, Commerce, and Energy, and the Nuclear Regulatory Commission.

PROGRAM ISSUES

The recent earthquake in Northridge, CA, illustrates the accomplishments of NEHRP but also raises some serious concerns. An important accomplishment of NEHRP is that most buildings and highway overpasses which were built to meet new seismic codes or retrofitted to meet those codes survived the Northridge earthquake, while other structures which did not meet the new seismic codes sustained serious damage. Many of the technologies used to meet these new codes were identified by NEHRP-funded researchers after assessing the damage from previous earthquakes, including Loma Prieta, CA, in 1989.

However, Northridge also highlighted other areas in which NEHRP activities should be targeted. One particular issue that needs to be addressed concerns "lifelines"—water, natural gas and electrical lines. Dramatic film from Northridge showed flooded streets at night with shooting jets of burning natural gas. These lifelines are easily broken and pose a serious danger to life and property in the aftermath of an earthquake. This program is a perfect example of why a multiple disciplinary approach is warranted for earthquake hazard reduction. Engineering and materials research are needed to make these crucial conduits stronger and more survivable. Advances in hazard warning systems will permit an automatic shutdown of high risk activities and services—such as the automatic shutdown of gas pipelines that feed the effected areas.

With the increasing need for more effective use by States and localities of technologies identified to mitigate earthquake damage and the limited resources committed to this program, the direction and focus of NEHRP is a critical issue. Therefore, the Committee intends to continue close oversight of NEHRP activities, focus, and direction over the next 2 years, in preparation for the FY 2000 reauthorization of the Earthquake Hazards Reduction Act of 1977.

For example, many would argue that NEHRP should further increase its focus on practical benefits for citizens of the United States. Of specific concern to the Committee is the need for greater attention in mapping earthquake hazards in traditionally understudied areas such as the eastern seaboard.

Also of concern is the extent to which existing earthquake engineering facilities in the United States are adequate to meet today's research needs. To address this concern the agencies participating in NEHRP are encouraged to work together to produce a plan for the effective use of existing engineering test facilities. As part of this effort the agencies may find that facilities and equipment need to be upgraded to provide effective support of the earthquake research and engineering efforts.

LEGISLATIVE HISTORY

On April 10th, 1997, the Subcommittee on Science, Technology, and Space held a hearing, chaired by Senator Frist, on NEHRP activities and the President's budget request. A panel of officials representing the four principal NEHRP agencies testified to the program's accomplishments in transferring key technologies to strengthen and retrofit structures for earthquakes. The witnesses testified that the lessons learned by the US from the Northridge earthquake, and by Japan from the Kobe Earthquake, have prompted the two countries to create an initiative that permits the exchange of data and techniques that can be used to mitigate the human and economic toll brought about by earthquakes. The first of two symposia has been held and 32 common areas of interest have been identified for further cooperation. The panel presented testimony about the effectiveness of a number of cooperative initiatives on which the NEHRP agencies have been working. Hazards US (HAZUS), an earthquake hazard/mitigation software program designed to predict earthquake impact on existing structures, was presented as an example of the successful cooperation of the NEHRP agencies. This program is directed to train state governments on the use of the software, which allows them to create an effective strategy for minimizing damage through mitigation actions, as well as planning for likely earthquake aftermath scenarios.

On June 16, 1997, S. 910 was introduced by Senator Frist and was referred to the Committee on Commerce, Science, and Transportation on June 18th, 1997.

On June 19, 1997, the Commerce Committee in open executive session, considered an amendment in the nature of a substitute to S. 910, offered by Senator Frist, and an amendment offered by Senator McCain. Without objection the amendments were adopted by the Committee, and the Committee ordered S. 910 to be reported as amended.

SUMMARY OF MAJOR PROVISIONS

S. 910, as reported, amends the Earthquake Hazards Reduction Act of 1977, which created NEHRP. Section 1 extends the authorization of funding through FY 1999 for each of the agencies that are involved in the NEHRP program. Specifically, the FY 1998

funding level for FEMA, the lead agency for NEHRP, is authorized at $20,900,000, a 3-percent increase over FY 1997 funding levels, and 11 percent over the President's budget request for FY 1998. FEMA is authorized to receive $21,500,000 for FY 1999 which represents a 3-percent increase over the FY 1998 levels. USGS is authorized at a funding level of $51,142,000 for FY 1998. Of the amounts authorized for USGS, $3,800,000 is directed to be used for the Global Seismic Network (GSN). This provision simplifies the process by which the GSN would be funded in that in previous years, funding was transferred to USGS by the Department of Defense. The FY 1998 authorized amount, reflects the President's request plus the funding for the GSN. The amounts authorized for USGS for FY 1999 reflect an increase of 3 percent over the FY 1998 level to adjust for inflation. The funding level of $2,000,000 for FY 1998 for NIST represents a 3.5-percent increase over the President's budget request for $1,932,000. NIST NEHRP activities are funded at $2,060,000 for FY 1999 which represents a 3-percent increase over FY 1998 levels. NSF is authorized at $30,370,000 for FY 1998, which is a 5-percent increase over the President's budget request, and is authorized at $31,280,000 for FY 1999, a 3-percent increase over the FY 1998 level. The funding levels for the outyears reflect an adjustment for inflation.

Section 2 authorizes USGS to develop an Automatic Seismic Warning System. It is anticipated that this system would become an integral part of the nation's plan to reduce the hazards that arise from the primary or secondary affects of a seismic event. Lives could be saved through the use of this system in that activities such as high-speed rail transportation could be selectively shut down before the seismic shock reaches the vehicle, and lifeline services could be preserved by automatically shutting down selected water, electrical and gas feeders to the affected areas. This legislation authorizes an additional $3,000,000 for each FY 1998 and FY 1999 for USGS to begin the development process of the warning system. It is understood that this level of funding is insufficient for completely developing and fully deploying a nationwide seismic warning system, especially when many of the existing seismic sensors that comprise the network may not have sufficient resolution to permit proper operation of the overall automatic warning system. The funding level authorized, however, is sufficient for starting the development process, including a regional prototype deployment by the end of the second year.

Section 2 also directs USGS to perform a general assessment of the existing seismic monitoring network to determine which senors need to be updated for the automatic warning system, seismic research, monitoring or other mission related tasks. Finally, Section 2 directs NSF, utilizing the resources of its NEHRP partners whenever practicable, to develop earth science teaching materials to be used with K–12 students, and to make them available for wide spread distribution to teachers, schools, and students. The teaching materials should include both lesson plans to facilitate the inclusion of the material into a teachers curriculum and hands-on activities that can be easily replicated in a school classroom.

Section 3 would direct all of the participating agencies, NSF, FEMA, USGS and NIST, working together, to develop a plan for

earthquake engineering research. The plan would address the effective use of existing testing facilities, make a determination as to what equipment needs to be updated, and make recommendations regarding new technology that should be integrated into these facilities as needed to support effective testing methodologies.

Section 4 would repeal section 6 and 7 of the Earthquake Hazards Reduction Act. Section 6 concerned a singular report issued from the Office of Science and Technology Policy that was due within 3 months of November 16, 1990. Section 7 was concerned with an Advisory Committee whose term expired on September 30, 1993.

ESTIMATED COSTS

In accordance with paragraph 11(a) of rule XXVI of the Standing Rules of the Senate and section 403 of the Congressional Budget Act of 1974, the Committee provides the following cost estimate, prepared by the Congressional Budget Office:

U.S. CONGRESS,
CONGRESSIONAL BUDGET OFFICE,
Washington, DC, July 16, 1997.

Hon. JOHN MCCAIN,
Chairman, Committee on Commerce, Science, and Transportation, U.S. Senate, Washington, DC.

DEAR MR. CHAIRMAN: The Congressional Budget Office has prepared the enclosed cost estimate for S. 910, a bill to authorize appropriations for carrying out the Earthquake Hazards Reduction Act of 1977 for fiscal years 1998 and 1999, and for other purposes.

If you wish further details on this estimate, we will be pleased to provide them. The CBO staff contacts are Gary Brown, Lisa Daley, Rachel Forward, and Kathy Gramp (for federal costs), and Karen McVey (for the state and local impact).

Sincerely,

JUNE E. O'NEILL, *Director.*

Enclosure.

CONGRESSIONAL BUDGET OFFICE COST ESTIMATE

S. 910—A bill to authorize appropriations for carrying out the Earthquake Hazards Reduction Act of 1977 for fiscal years 1998 and 1999, and for other purposes

Summary: S. 910 would authorize appropriations totaling $104 million in 1998 and $108 million in 1999 for the Federal Emergency Management Agency (FEMA), the U.S. Geological Survey (USGS), the National Science Foundation (NSF), and the National Institute of Science and Technology (NIST) to carry out the provisions of the Earthquake Hazards Reduction Act of 1977. The bill also would authorize USGS to develop and deploy a prototype of a real-time seismic warning system and would authorize additional appropriations of $3 million in both 1998 and 1999 for that purpose.

Assuming appropriation of the authorized amounts, CBO estimates that enacting S. 910 would result in additional discretionary spending of $218 million over the 1998–2002 period. The legislation

would not affect direct spending or receipts; therefore, pay-as-you-go procedures would not apply. The bill contains no intergovernmental or private-sector mandates as defined in the Unfunded Mandates Reform Act of 1995 (UMRA), and would not impose any costs on state, local, or tribal governments.

Estimated cost to the Federal Government: For the purposes of this estimate, CBO assumes that all amounts authorized in S. 910 would be appropriated by the start of each fiscal year and that outlays would follow the historical spending patterns for these and similar programs. The funding levels included in the bill are meant to pay for both programs and associated administrative expenses. The estimated budgetary impact of S. 910 is shown in the following table.

[By fiscal year, in millions of dollars]

	1997	1998	1999	2000	2001	2002
SPENDING SUBJECT TO APPROPRIATION						
Spending under current law:						
Budget authority [1]	98	0	0	0	0	0
Estimated outlays	90	27	8	3	1	0
Proposed changes:						
USGS:						
Authorization level	0	54	56	0	0	0
Estimated outlays	0	51	56	3	0	0
NSF:						
Authorization level	0	30	31	0	0	0
Estimated outlays	0	9	25	20	5	2
FEMA:						
Authorization level	0	21	22	0	0	0
Estimated outlays	0	13	19	8	3	0
NIST:						
Authorization level	0	2	2	0	0	0
Estimated outlays	0	2	2	0	0	0
Total:						
Authorization level	0	107	111	0	0	0
Estimated outlays	0	75	102	31	8	2
Spending under S. 910:						
Authorization level [1]	98	107	111	0	0	0
Estimated outlays	90	102	110	34	9	2

[1] The 1997 level is the amount appropriated for that year.

The costs of this legislation fall within budget functions 250 (general science, space, and technology), 300 (natural resources and environment), 370 (commerce and housing credit), and 450 (community and regional development).

Pay-as-you-go considerations: None.

Estimated impact on state, local, and tribal governments: S. 910 contains no intergovernmental mandates as defined in UMRA and would impose no costs on state, local, or tribal governments. The bill would allow the Director of the National Science Foundation to use appropriated funds to develop and make available to schools and local educational agencies—at minimal cost—earth science teaching materials.

Estimated impact on the private sector: This bill would impose no new private-sector mandates as defined in UMRA.

Estimate prepared by: Federal costs: Gary Brown, Lisa Daley, Rachel Forward, and Kathy Gramp; impact on state, local, and tribal governments: Karen L. McVey.

Estimated approved by: Robert A. Sunshine, Deputy Assistant Director for Budget Analysis.

REGULATORY IMPACT STATEMENT

In accordance with paragraph 11(b) of rule XXVI of the Standing Rules of the Senate, the Committee provides the following evaluation of the regulatory impact of the legislation, as reported.

NUMBER OF PERSONS COVERED

This legislation reauthorizes appropriations for NEHRP and requires an assessment by the President of earthquake engineering research and testing capabilities. The result of continued funding for NEHRP may help to reduce the number of persons injured or killed by earthquakes.

ECONOMIC IMPACT

This legislation authorizes continued Federal appropriations for the four NEHRP agencies. Providing for continued funding should mitigate loss of property and associated private and Federal costs due to earthquake damage.

PRIVACY

This legislation will not have any adverse impact on the personal privacy of individuals.

PAPERWORK

This legislation requires the President to submit an assessment of earthquake engineering research and testing capabilities in the United States within 9 months of enactment of the bill.

SECTION-BY-SECTION ANALYSIS

Section 1. Authorization of appropriations

This section would extend the authorization of appropriations for the four NEHRP agencies-FEMA, USGS, NSF, and NIST-at or slightly above the President's request for FY 1998 and at a 3-percent increase for FY 1999 to adjust for inflation. The total NEHRP authorization is $103.2 million for FY 1998 and $106.3 million in FY 1999, broken down as follows: FEMA is authorized at $25 million for FY 1998 and $25.8 million FY 1999; USGS is authorized at $49.2 million for FY 1998 and $50.7 million in FY 1999; NSF is authorized at $27.1 million for FY 1998 and $27.9 million in FY 1999; and NIST is authorized at $1.9 million for FY 1998 and just under $2 million in FY 1999.

Of the funds authorized for USGS, $8,000,000 in FY1998 and $8,250,000 in FY1999 is intended to fund extramural research activities.

Section 2. Authorization of real-time seismic hazard warning system development, and other activities

This section would authorize USGS to develop a real-time seismic hazard warning system. The deployment of a system such as this would save lives and reduce property damage. Beyond the

damage caused by earthquake motions themselves, significant damage is caused by the compromise of so called "lifelines" within the effected area. Ruptured gas lines can trigger large fires and severed water mains can reduce the water pressure available to fight fires. Downed power lines can pose significant threats to individuals and property. A real-time seismic hazard warning system can enable the deployment of systems that automatically shutdown main feeders to areas that would experience moderate to severe damage by a seismic event such as an earthquake. Subsection (a) would define both high-risk activity and the term real-time seismic warning system. Systems such as this are complex to design, challenging to test, and difficult to deploy. Subsection(a) also would authorize $30,000,000 in funding for FY 1998 and FY 1999, to be used to ensure that any design contemplated is thoroughly examined through the development of a prototype, so that its architecture can serve as a framework of a scalable, redundant, highly reliable and highly available system. In order to carryout the program, the Director would be required to provide for the upgrading of the network of seismic sensors participating in the prototype to improve the accuracy of measurement of seismic activity, and would be required to develop a communications and computer infrastructure. The Committee is very interested in the implementation of a real-time seismic hazard warning system; therefore, the Director would be required by this subsection to furnish a report that contains an implementation plan no later than 120 days after enactment of this bill. An annual report summarizing the progress in implementing the plan also would be required.

The Committee is concerned with the capability of the regional seismic monitoring networks. The date gathering sensors deployed as part of this system may have insufficient capacity, thus limiting their usefulness in supporting research efforts, as well as serving as a basis for other activities such as the warning system mentioned above. Subsection (b) would require the Director of USGS to provide an assessment of these sensors including cost estimates and needs assessment for upgrading the sensors so that the data produced by them is more accurate and is better suited for research and monitoring activities, including operational programs such as a seismic warning system. The Director would be required to submit the assessment to Congress one year after the date of enactment.

In keeping with this Committee's interest in the widest possible dissemination of science information, Subsection (c) of this bill would direct NSF to develop and make available earth science teaching materials. The Committee recognizes that the NHERP agencies have historically cooperated very well to discharge their duties under the law. We expect no less in this area. The Committee recognizes the solid contributions that FEMA has made in creating educational materials for the classroom, and we are counting on the utilization of these as well as other materials by NSF to satisfy this requirement. Furthermore, the Committee expects that these activities be carried out in a manner that conforms to the authorities of other NEHRP agencies.

The Committee is concerned that there are numerous seismic zones in the United States, specifically in the eastern portion of the

country, which have not been studied closely enough to understand the possible seismic hazards they pose. Therefore Subsection (d) would require the Director to conduct a project that improves seismic hazard assessments in traditionally understudied areas. The Director would be required to submit a report to Congress annually during the duration of the project with an assessment of the seismic hazards in understudied areas.

Finally, Subsection (e) would require the Director of FEMA to conduct a study of facilities that can be used to conduct disaster response training applicable to earthquake or other seismic events. Concern has been expressed that current training facilities may be inadequate, resulting in long lead times for training of State and local personnel needed to successfully handle the challenges of earthquake and seismic events. Training facilities are crucial to maintaining a cadre of effective personnel so that quick and correct actions are taken in the event of a major seismic event. The assessment would include a review of FEMA's disaster training programs, an estimate of the extent to which personnel who seek training are denied due to inadequate capabilities, and a recommendation on the need for additional training centers. The Director would be required to submit a report of the findings to Congress within 6 months of enactment.

Section 3. Comprehensive engineering research plan

Section 3 would amend the charter of each of the four participating agencies involved in the NHERP to require the joint development of a comprehensive earthquake engineering research plan. The plan would address the effective use of existing testing facilities, provide a process for making determinations as to what equipment and facilities need to be updated when necessary, and make recommendations regarding new technology that should be integrated into these facilities as needed to support effective testing methodologies.

Section 4. Repeals

Section 4 would repeal sections 6 and 7 of the Earthquake Hazards Reduction Act. Section 6 required a singular report issued by the Office of Science and Technology Policy that was due within 3 months of November 16, 1990. Section 7 covered the responsibilities of an Advisory Committee whose term expired on September 30, 1993.

CHANGES IN EXISTING LAW

In compliance with paragraph 12 of rule XXVI of the Standing Rules of the Senate, changes in existing law made by the bill, as reported, are shown as follows (existing law proposed to be omitted is enclosed in black brackets, new material is printed in italic, existing law in which no change is proposed is shown in roman):

TITLE 42. THE PUBLIC HEALTH AND WELFARE

CHAPTER 86. EARTHQUAKE HAZARDS REDUCTION

§ 7704. National Earthquake Hazards Reduction Program

(a) ESTABLISHMENT.—There is established a National Earthquake Hazards Reduction Program.

(b) RESPONSIBILITIES OF PROGRAM AGENCIES.

(1) LEAD AGENCY.—The Federal Emergency Management Agency (hereafter in this Act referred to as the "Agency") shall have the primary responsibility for planning and coordinating the Program. In carrying out this paragraph, the Director of the Agency shall—

(A) prepare, in conjunction with the other Program agencies, an annual budget for the Program to be submitted to the Office of Management and Budget;

(B) ensure that the Program includes the necessary steps to promote the implementation of earthquake hazard reduction measures by Federal, State, and local governments, national standards and model building code organizations, architects and engineers, and others with a role in planning and constructing buildings and lifelines;

(C) prepare, in conjunction with the other Program agencies, a written plan for the Program, which shall include specific tasks and milestones for each Program agency, and which shall be submitted to the Congress and updated at such times as may be required by significant Program events, but in no event less frequently than every 3 years;

(D) prepare, in conjunction with the other Program agencies, a biennial report, to be submitted to the Congress within 90 days after the end of each even-numbered fiscal year, which shall describe the activities and achievements of the Program during the preceding two fiscal years; **[**and**]**

(E) request the assistance of Federal agencies other than the Program agencies as necessary to assist in carrying out this **[**Act.**]** *Act; and*

(F) work with the National Science Foundation, the National Institute of Standards and Technology, and the United States Geological Survey, to develop a comprehensive plan for earthquake engineering research to effectively use existing testing facilities and laboratories (existing at the time of the development of the plan), upgrade facilities and equipment as needed, and integrate new, innovative testing approaches to the research infrastructure in a systematic manner.

The principal official carrying out the responsibilities described in this paragraph shall be at a level no lower than that of Associate Director.

(2) FEDERAL EMERGENCY MANAGEMENT AGENCY.—

(A) PROGRAM RESPONSIBILITIES.—In addition to the lead agency responsibilities described in paragraph (1), the Director of the Agency shall—

(i) operate a program of grants and technical assistance which would enable States to develop preparedness and response plans, prepare inventories and conduct seismic safety inspections of critical structures and lifelines, update building and zoning codes and ordinances to enhance seismic safety, increase earthquake awareness and education, and encourage the development of multi-State groups for such purposes;

(ii) prepare and execute, in conjunction with the Program agencies, the Department of Education, other Federal agencies, and private sector groups, a comprehensive earthquake education and public awareness program, to include development of materials and their wide dissemination to schools and the general public;

(iii) prepare and disseminate widely, with the assistance of the National Institute of Standards and Technology, other Federal agencies, and private sector groups, information on building codes and practices for structures and lifelines;

(iv) develop, and coordinate the execution of, Federal interagency plans to respond to an earthquake, with specific plans for each high-risk area which ensure the availability of adequate emergency medical resources, search and rescue personnel and equipment, and emergency broadcast capability;

(v) develop approaches to combine measures for earthquake hazards reduction with measures for reduction of other natural and technological hazards; and

(vi) provide response recommendations to communities after an earthquake prediction has been made under paragraph (3)(D).

In addition, the Director of the Agency may enter into cooperative agreements or contracts with States and local jurisdictions to establish demonstration projects on earthquake hazard mitigation, to link earthquake research and mitigation efforts with emergency management programs, or to prepare educational materials for national distribution.

(B) STATE ASSISTANCE PROGRAM CRITERIA.—In order to qualify for assistance under subparagraph (A)(i), a state must—

(i) demonstrate that the assistance will result in enhanced seismic safety in the State;

(ii) provide a share of the costs for the activities for which assistance is being given, in accordance with subparagraph (C); and

(iii) meet such other requirements as the Director of the Agency shall prescribe.

(C) NON-FEDERAL COST SHARING.—

(i) In the case of any State which has received, before October 1, 1990, a grant from the Agency for activities under this Act which included a requirement

for cost sharing by matching such grant, any grant obtained from the Agency for activities under subparagraph (A)(i) after such date shall not include a requirement for cost sharing in an amount greater than 50 percent of the cost of the project for which the grant is made.

(ii) In the case of any State which has not received, before October 1, 1990, a grant from the Agency for activities under this Act which included a requirement for cost sharing by matching such grant, any grant obtained from the Agency for activities under subparagraph (A)(i) after such date—

(I) shall not include a requirement for cost sharing for the first fiscal year of such a grant;

(II) shall not include a requirement for cost sharing in an amount greater that 25 percent of the cost of the project for which the grant is made for the second fiscal year of such grant, and any cost sharing requirement may be satisfied through in-kind contributions;

(III) shall not include a requirement for cost sharing in an amount greater than 35 percent of the cost of the project for which the grant is made for the third fiscal year of such grant and any cost sharing requirement may be satisfied through in-kind contributions; and

(IV) shall not include a requirement for cost sharing in an amount greater than 50 percent of the cost of the project for which the grant is made for the fourth and subsequent fiscal years of such grant.

(3) UNITED STATES GEOLOGICAL SURVEY.—The United States Geological Survey shall conduct research necessary to characterize and identify earthquake hazards, assess earthquake risks, monitor seismic activity, and improve earthquake predictions. In carrying out this paragraph, the Director of the United States Geological Survey shall—

(A) conduct a systematic assessment of the seismic risks in each region of the Nation prone to earthquakes, including, where appropriate, the establishment and operation of intensive monitoring projects on hazardous faults, seismic microzonation studies in urban and other developed areas where earthquake risk is determined to be significant, and engineering seismology studies;

(B) work with officials of State and local governments to ensure that they are knowledgeable about the specific seismic risks in their areas:

(C) develop standard procedures, in consultation with the Agency, for issuing earthquake predictions, including aftershock advisories;

(D) issue when necessary, and notify the Director of the Agency of, an earthquake prediction or other earthquake advisory, which may be evaluated by the National Earthquake Prediction Evaluation Council, which shall be ex-

empt from the requirements of section 10(a)(2) of the Federal Advisory Committee Act [5 U.S.C. App.] when meeting for such purposes;

(E) establish, using existing facilities, a Center for the International Exchange of Earthquake Information which shall—

(i) promote the exchange of information on earthquake research and earthquake preparedness between the United States and other nations;

(ii) maintain a library containing selected reports, research papers, and data produced through the Program;

(iii) answer requests from other nations for information on United States earthquake research and earthquake preparedness programs; and

(iv) direct foreign requests to the agency involved in the Program which is best able to respond to the request; [and]

(F) operate a National Seismic Network; [and]

(G) support regional seismic networks, which shall complement the National Seismic [Network.] *Network; and*

(H) work with the National Science Foundation, the Federal Emergency Management Agency, and the National Institute of Standards and Technology to develop a comprehensive plan for earthquake engineering research to effectively use existing testing facilities and laboratories (in existence at the time of the development of the plan), upgrade facilities and equipment as needed, and integrate new, innovative testing approaches to the research infrastructure in a systematic manner.

(4) NATIONAL SCIENCE FOUNDATION.—The National Science Foundation shall be responsible for funding research on earth sciences to improve the understanding of the causes and behavior of earthquakes, on earthquake engineering, and on human response to earthquakes. In carrying out this paragraph, the Director of the National Science Foundation shall—

(A) encourage prompt dissemination of significant findings, sharing of data, samples, physical collections, and other supporting materials, and development of intellectual property so research results can be used by appropriate organizations to mitigate earthquake damage;

(B) in addition to supporting individual investigators, support university research consortia and centers for research in geosciences and in earthquake engineering;

(C) work closely with the United States Geological Survey to identify geographic regions of national concern that should be the focus of targeted solicitations for earthquake-related research proposals;

(D) emphasize, in earthquake engineering research, development of economically feasible methods to retrofit existing buildings and to protect lifelines to mitigate earthquake damage; [and]

(E) support research that studies the political, economic, and social factors that influence the implementation of hazard reduction [measures] *measures; and*

(F) develop, in conjunction with the Federal Emergency Management Agency, the National Institute of Standards and Technology, and the United States Geological Survey, a comprehensive plan for earthquake engineering research to effectively use existing testing facilities and laboratories (in existence at the time of the development of the plan), upgrade facilities and equipment as needed, and integrate new, innovative testing approaches to the research infrastructure in a systematic manner.

(5) NATIONAL INSTITUTE OF STANDARDS AND TECHNOLOGY.—The National Institute of Standards and Technology shall be responsible for carrying out research and development to improve building codes and standards and practices for structures and lifelines. In carrying out this paragraph, the Director of the National Institute of Standards and Technology shall—

(A) work closely with national standards and model building code organizations, in conjunction with the Agency, to promote the implementation of research results;

(B) promote better building practices among architects and engineers; [and]

(C) work closely with national standards organizations to develop seismic safety standards and practices for new and existing [lifelines.] *lifelines; and*

(D) work with the National Science Foundation, the Federal Emergency Management Agency, and the United States Geological Survey to develop a comprehensive plan for earthquake engineering research to effectively use existing testing facilities and laboratories (in existence at the time of the development of the plan), upgrade facilities and equipment as needed, and integrate new, innovative testing approaches to the research infrastructure in a systematic manner.

[§ 7705. Office of Science and Technology Policy Report

[The Director of the Office of Science and Technology Policy shall, within 3 months after the date of the enactment of the National Earthquake Hazards Reduction Program Reauthorization Act, report to the Committee on Commerce, Science, and Transportation of the Senate and to the Committee on Science, Space, and Technology and the Committee on Interior and Insular Affairs of the House of Representatives [Committee on Natural Resources of the House of Representatives] with respect to how the Office of Science and Technology Policy can play a role in interagency coordination, planning, and operation of the Program.]

[§ 7705a. Advisory Committee

[There is established a National Earthquake Hazards Reduction Program Advisory Committee (hereafter in this Act [42 U.S.C. 7701 et seq.] referred to as the "Advisory Committee"), which shall advise the Program agencies on planning and implementing the Program. The Director of the Agency shall, in consultation with the di-

rectors of the Program agencies, determine the number of members on the Advisory Committee and the duration of their terms, and appoint the Chairman and Members of the Advisory Committee. The Advisory Committee shall have balanced representation of State and local governments, the design professions, the research community, business and industry, and the general public. The Advisory Committee shall meet at the call of the Chairman, but in no event less often than every 6 months. The Advisory Committee shall submit a written report directly to the Congress, without review by the Office of Management and Budget or any other agency, by January 31 of each calendar year beginning after the date of enactment of the National Earthquake Hazards Reduction Program Reauthorization Act, which shall describe any recommendations the Advisory Committee has made to the Program agencies during the preceding year. Members of the Advisory Committee shall serve without compensation but may receive reimbursement for expenses. All expenses of the Advisory Committee shall be borne by the Agency. The Advisory Committee shall expire September 30, 1993.]

§ 7706. Authorization of appropriations

(a) GENERAL AUTHORIZATION FOR THE PROGRAM.—

(1) There are authorized to be appropriated to the President to carry out the provisions of sections 5 and 6 of this Act [42 U.S.C. 7704, 7705] (in addition to any authorizations for similar purposes included in other Acts and the authorizations set forth in subsections (b) and (c) of this section), not to exceed $1,000,000 for the fiscal year ending September 30, 1978, not to exceed $2,000,000 for the fiscal year ending September 30, 1979, and not to exceed $2,000,000 for the fiscal year ending September 30, 1980.

(2) There are authorized to be appropriated to the Director to carry out the provisions of sections 5 and 6 of this Act [42 U.S.C. 7704, 7705] for the fiscal year ending September 30, 1981—

(A) $1,000,000 for continuation of the Interagency Committee on Seismic Safety in Construction and the Building Seismic Safety Council programs,

(B) $1,500,000 for plans and preparedness for earthquake disasters,

(C) $500,000 for prediction response planning,

(D) $600,000 for architectural and engineering planning and practice programs,

(E) $1,000,000 for development and application of a public education program,

(F) $3,000,000 for use by the National Science Foundation in addition to the amount authorized to be appropriated under subsection (c), which amount includes $2,400,000 for earthquake policy research and $600,000 for the strong ground motion element of the siting program, and

(G) $1,000,000 for use by the Center for Building Technology, National Bureau of Standards in addition to the

amount authorized to be appropriated under subsection (d) for earthquake activities in the Center.

(3) There are authorized to be appropriated to the Director for the fiscal year ending September 30, 1982, $2,000,000 to carry out the provisions of sections 5 and 6 of this Act [42 U.S.C. 7704, 7705].

(4) There are authorized to be appropriated to the Director, to carry out the provisions of sections 5 and 6 of this Act [42 U.S.C. 7704, 7705], $1,281,000 for the fiscal year ending September 30, 1983.

(5) There are authorized to be appropriated to the Director, to carry out the provisions of sections 5 and 6 of this Act [42 U.S.C. 7704, 7705], for the fiscal year ending September 30, 1984, $3,705,000, and for the fiscal year ending September 30, 1985, $6,096,000.

(6) There are authorized to be appropriated to the Director, to carry out the provisions of sections 5 and 6 of this Act [42 U.S.C. 7704, 7705], for the fiscal year ending September 30, 1986, $5,596,000, and for the fiscal year ending September 30, 1987, $5,848,000.

(7) There are authorized to be appropriated to the Director of the Agency, to carry out this Act [42 U.S.C. 7701 et seq.] $5,778,000 for the fiscal year ending September 30, 1988, $5,788,000 for the fiscal year ending September 30, 1989, $8,798,000 for the fiscal year ending September 30, 1990, $14,750,000 for the fiscal year ending September 30, 1991, $19,000,000 for the fiscal year ending September 30, 1992, $22,000,000 for the fiscal year ending September 30, 1993, $25,000,000 for the fiscal year ending September 30, 1995, [and] $25,750,000 for the fiscal year ending September 30, [1996.], *1996, $20,900,000 for the fiscal year ending September 30, 1998, and $21,500,000 for the fiscal year ending September 30, 1999.*

(b) GEOLOGICAL SURVEY.—There are authorized to be appropriated to the Secretary of the Interior for purposes of carrying out, through the Director of the United States Geological Survey, the responsibilities that may be assigned to the Director under this Act not to exceed $27,500,000 for the fiscal year ending September 30, 1978; not to exceed $35,000,000 for the fiscal year ending September 30, 1979; not to exceed $40,000,000 for the fiscal year ending September 30, 1980; $32,484,000 for the fiscal year ending September 30, 1981; $34,425,000 for the fiscal year ending September 30, 1982; $31,843,000 for the fiscal year ending September 30, 1983; $35,524,000 for the fiscal year ending September 30, 1984; $37,300,200 for the fiscal year ending September 30, 1985[;] $35,578,000 for the fiscal year ending September 30, 1986; $37,179,000 for the fiscal year ending September 30, 1987; $38,540,000 for the fiscal year ending September 30, 1988; $41,819,000 for the fiscal year ending September 30, 1989; $55,283,000 for the fiscal year ending September 30, 1990, of which $8,000,000 shall be for earthquake investigations under section 11 [42 U.S.C. 7705e]; $50,000,000 for the fiscal year ending September 30, 1991; $54,500,000 for the fiscal year ending September 30, 1992; $62,500,000 for the fiscal year ending September 30, 1993;

$49,200,000 for the fiscal year ending September 30, 1995; and $50,676,000 for the fiscal year ending September 30, [1996.] *1996; $15,142,000 for the fiscal year ending September 30, 1998, of which $3,800,000 shall be used for the Global Seismic Network operated by the Agency; and $52,676,000 for the fiscal year ending September 30, 1999, of which $3,800,000 shall be used for the Global Seismic Network operated by the Agency.*

EARTHQUAKE HAZARDS REDUCTION ACT OF 1977

* * * * * * *

SEC. 12. AUTHORIZATION OF APPROPRIATIONS

(a) GENERAL AUTHORIZATION FOR THE PROGRAM.—

* * * * * * *

(7) There are authorized to be appropriated to the Director of the Agency, to carry out this Act, $5,778,000 for the fiscal year ending September 30, 1988, $5,788,000 for the fiscal year ending September 30, 1989, $8,798,000 for the fiscal year ending September 30, 1990, $14,750,000 for the fiscal year ending September 30, 1991, $19,000,000 for the fiscal year ending September 30, 1992, $22,000,000 for the fiscal year ending September 30, 1993, $25,000,000 for the fiscal eyar ending September 30, [1995.] *1995, $20,900,000 for the fiscal year ending September 30, 1998, and $21,500,000 for the fiscal year ending September 30, 1999.*

(B) GEOLOGICAL SURVEY.—There are authorized to be appropriated to the Secretary of the Interior for purposes of carrying out, through the Director of the United States Geological Survey, the responsibilities that may be assigned to the Director under this Act not to exceed $27,500,000 for the fiscal year ending September 30, 1978; not to exceed $35,000,000 for the fiscal year ending September 30, 1979; not to exceed $40,000,000 for the fiscal year ending September 30, 1980; $32,484,000 for the fiscal year ending September 30, 1981, $32,425,000 for the fiscal year ending September 30, 1982; $31,843,000 for the fiscal year ending September 30, 1983; $35,524,000 for the fiscal year ending September 30, 1984; $37,300,200 for the fiscal year ending September 30, 1985; $35,578,000 for the fiscal year ending September 30, 1986; $37,179,000 for the fiscal year ending September 30, 1987; $38,540,000 for the fiscal year ending September 30, 1988; $41,819,000 for the fiscal year ending September 30, 1989; $55,283,000 for the fiscal year ending September 30, 1990, of which $8,000,000 shall be for earthquake investigations under section 11; $50,000,000 for the fiscal year ending September 30, 1991; $54,500,000 for the fiscal year ending September 30, 1992; $62,500,000 for the fiscal year ending September 30, 1993; $49,200,000 for the fiscal year ending September 30, 1995; [and] $50,676,000 for the fiscal year ending September 30, [1996.] *1996; $51,142,000 for the fiscal year ending September 30, 1998, of which $3,800,000 shall be used for the Global Seismic Network operated by the Agency; and $52,676,000 for the fiscal year ending September 30, 1999, of which $3,800,000 shall be used for the Global Seismic Network operated by the Agency. Of the amounts authorized to be appropriated under this subsection, at least—*

"(1) $8,000,000 of the amount authorized to be appropriated for the fiscal year ending September 30, 1998; and

"(2) $8,250,000 of the amount authorized for the fiscal year ending September 30, 1999,

shall be used for carrying out a competitive, peer-reviewed program under which the Director, in close coordination with and as a complement to related activities of the United States Geological Survey, awards grants to, or enters into cooperative agreements with, State and local governments and persons or entities from the academic community and the private sector.

(c) NATIONAL SCIENCE FOUNDATION.—To enable the Foundation to carry out responsibilities that may be assigned to it under this Act, there are authorized to be appropriated to the Foundation not to exceed $27,500,000 for the fiscal year ending September 30, 1978; not to exceed $35,000,000 for the fiscal year ending September 30, 1979; not to exceed $40,000,000 for the fiscal year ending September 30, 1980; $26,600,000 for the fiscal year ending September 30, 1981; $27,150,000 for the fiscal year ending September 30, 1982; $25,000,000 for the fiscal year ending September 30, 1983; $25,800,000 for the fiscal year ending September 30, 1984; $28,665,000 for the fiscal year ending September 30, 1985[;] $27,760,000 for the fiscal year ending September 30, 1986; $29,009,000 for the fiscal year ending September 30, 1987; $28,235,000 for the fiscal year ending September 30, 1988; $31,634,000 for the fiscal year ending September 30, 1989; $38,454,000 for the fiscal year ending September 30, 1990. Of the amounts authorized for Engineering under section 101(d)(1)(B) of the National Science Foundation Authorization Act of 1988, $24,000,000 is authorized for carrying out this Act [42 U.S.C. 7701 et seq.] for the fiscal year ending September 30, 1991, and of the amounts authorized for Geosciences under section 101(d)(1)(D) of the National Science Foundation Authorization Act of 1988, $13,000,000 is authorized for carrying out this Act for the fiscal year ending September 30, 1991. Of the amounts authorized for Research and Related Activities under section 101(e)(1) of the National Science Foundation Authorization Act of 1988, $29,000,000 is authorized for engineering research under this Act, and $14,750,000 is authorized for geosciences research under this Act, for the fiscal year ending September 30, 1992. Of the amounts authorized for Research and Related Activities under section 101(f)(1) of the National Science Foundation Authorization Act of 1988, $34,500,000 is authorized for engineering research under this Act, and $17,500,000 is authorized for geosciences research under this Act, for the fiscal year ending September 30, 1993. There are authorized to be appropriated, out of funds otherwise authorized to be appropriated to the National Science Foundation; (1) $16, 200,000 for engineering research and $10,900,000 for geosciences research for the fiscal year ending September 30, 1995, **[**and**]** (2) $16,686,000 for engineering research and $11,227,000 for geosciences research for the fiscal year ending September 30, **[**1996**]** *1996, (3) $18,450,000 for engineering research and $11,920,000 for geosciences research for the fiscal year ending September 30, 1997, and (4) $19,000,000 for engineering research and $12,280,000 for geosciences research for the fiscal year ending September 30, 1999.*

(d) NATIONAL INSTITUTE OF STANDARD AND TECHNOLOGY.—To enable the National Institute of Standards and Technology to carry out responsibilities that may be assigned to it under this Act, there are authorized to be appropriated $425,000 for the fiscal year ending September 30, 1981; $425,000 for the fiscal year ending September 30, 1983; $475,000 for the fiscal year ending September 30, 1984; $498,750 for the fiscal year ending September 30, 1985[;] $499,000 for the fiscal year ending September 30, 1986; $521,000 for the fiscal year ending September 30, 1986; $521,000 for the fiscal year ending September 30, 1987; $525,000 for the fiscal year ending September 30, 1988; $525,000 for the fiscal year ending September 30, 1989; $2,525,000 for the fiscal year ending September 30, 1990; $1,000,000 for the fiscal year ending September 30, 1991; $3,000,000 for the fiscal year ending September 30, 1992; and $4,750,000 for the fiscal year ending September 30, 1993. There are authorized to be appropriated, out of funds otherwise authorized to be appropriated to the National Institute of Standards and Technology, $1,900,000 for the fiscal year ending September 30, 1995, [and] $1,957,000 for the fiscal year ending September 30, [1996.] *1996, $2,000,000 for the fiscal year ending September 30, 1998, and $2,060,000 for the fiscal year ending September 30, 1999.*

(e) FUNDS FOR CERTAIN REQUIRED ADJUSTMENTS.—For each of the fiscal years ending September 30, 1982, September 30, 1983, September 30, 1984, and September 30, 1985, there are authorized to be appropriated such further sums as may be necessary for adjustments required by law in salaries, pay, retirement, and employee benefits incurred in the conduct of activities for which funds are authorized by the preceding provisions of this section.

(f) AVAILABILITY OF FUNDS—Funds appropriated for fiscal years 1991, 1992, and 1993 pursuant to this section shall remain available until expended.

○